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EXAMINER	
TUCKER, WESLEY J	
ART UNIT	**PAPER NUMBER**
2623	

DATE MAILED: 11/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/976,739	WOOTEN ET AL.	
	Examiner	Art Unit	
	Wes Tucker	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15 and 17-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8-2-05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 11th 2005 has been entered.

Response to Amendment

2. The amended claims filed on October 11th as well as the after-final amendments filed August 23rd 2005 have been entered and made of record.

3. Claims 1, 2, 4, 5, 8, 10, 11-15, 17, 18 and 20 are amended as of the after-final amendment and the request for continued examination amendment cited above. Claim 16 is canceled. Claims 1-15 and 17-20 remain pending.

4. Applicants remarks are not considered fully persuasive for at least the following reasons:

5. Applicant explains on page 7 of the remarks that:

The logic behind applicant's arguments stems from the definition of the term "defect spatial signature." In "an integrated Spatial Signature Analysis and Automatic Defect Classification System," Shaun S. Gleason et al. define a "defect spatial signature" as a pattern of defects.

First of all, it should be noted that while an Applicant may be his own lexicographer of terms, that the definition of such a term must appear in the Applicant's own original specification in some form. The Applicant may not seek to define an essential term found in the claims and specification simply by pointing to a prior art document. So it should be noted that this definition supposedly disclosed by Gleason is not admissible and not given any weight in the interpretation of the claims. It is noted that the term appears in the Applicant's specification on page 1, it reads:

Hence, semiconductor manufacturers have incorporated inspection techniques using optical image devices capable of discerning unique defect patterns on a wafer surface, commonly referred to as defect spatial signatures.

Referring now to the reference of Gleason, it should be noted that Applicant does not cite the particular passage in the mentioned reference to Gleason where this definition can be found. After reading the reference to Gleason, Examiner believes this claimed definition comes from a passage from the second page of the reference to Gleason in the first paragraph under the section entitled Spatial Signature Analysis reads as follows:

SSA is a defect analysis technology that takes as its input a wafer map (a list of defect coordinate locations generated by an optical or laser based wafer inspection tool and locates <u>patterns of defects or spatial signatures</u>.

Gleason goes on in the next paragraph to disclose in the next paragraph that:

The spatial signature may be indicative of one particular problem in the manufacturing line. For example... a distinctive scratch ... may be used to automatically catch that distinctive scratch "signature"

Here the spatial signature seems to indicate the presence of a single defect though it is a distinctive one. In the definition proposed by the Applicant, the question is: does a single defect qualify as a defect spatial signature? It would appear that one defect can also be interpreted as having a pattern in the way it is shaped or that the pattern of defects for a distinctive scratch as cited above can be simply one scratch or a single defect. The point is that there is no clear definition between what constitutes a single defect having a shape or pattern and what constitutes a pattern of defects.

So when Applicant makes the argument from page 7 of the remarks that:

Thus Ferrell et al. view the defects from a microscopic perspective, whereas applicants analyze the pattern of defects rather than characteristics of individual defects.

This is misleading because a characteristic of the individual defect can be interpreted as the pattern or shape. How is one to know the difference between a random defect and a pattern of defects or a defect with a pattern? For example if a defect has a large continuous semicircular arc caused by some known abrasion, is this

defect a random defect or a pattern of joining defects in a pattern or a defect with a pattern? The point is a "defect spatial signature" is and must be interpreted from the three words that make up the phrase as a defect (defect) found somewhere (spatial) of some form (signature). If Applicant seeks to limit the scope of the claims by defining a defect spatial signature as a pattern of a plurality of defects or separate markings, etc. it must be explicitly stated. Otherwise the claims must be read reasonably broad.

And as interpreted the reference to Ferrell et al. stills reads on the claimed limitations argued by Applicant.

Ferrell discloses determining feature vectors which are interpreted as defect spatial signatures because as disclosed in column 2, lines 60-65, a feature vector can correspond to an anomaly/defect characteristic. Applicant claims that a defect spatial signature describes a pattern of defects. This is also disclosed broadly by Ferrell in column 3, lines 1-11, where Ferrell teaches that the feature vector describing the defect location further defines a defect region using a characteristic defect mask. Ferrell therefore sufficiently discloses determining defect spatial signatures in the disclosure of the determining of the feature vectors corresponding to defect locations, regions and characteristics. There should be no question that the defect spatial signatures claimed are effectively equivalent to the feature vectors of Ferrell used to describe defects.

Ferrell further discloses that the defect spatial signatures are uncharacterized in column 6, lines 6-13, because it is taught that all the images may be indexed and simply stored in a single file and needn't be stored in any particular database. This is

interpreted to mean that the spatial signatures or feature vectors are not categorized in any way and that they are all thrown together in one file as a list of items.

The defect spatial signatures in the defect database are uncategorized data in that:

1. They can correspond to unclassified defects (column 13, lines 3-5).

2. Their arrangement in the HST is according to their relative similarity (column 9, lines 48-56), as opposed to some defect classification schema.

6. Applicant further argues on page 8 of the remarks that:

Because the images of Ferrell et al. are organized, they are categorized.

This statement is not accurate. Things can be organized without being categorized. In Ferrell, the feature vectors are stored in a single file (column 6, lines 6-13). This does not categorize the feature vectors. If a set of data is to be categorized, elements of that set must be put into categories and classified, if all the data is found in one place organized perhaps by serial number or order of time the data was received, this does not inherently categorize the data. The data would have to be separated into some form of classes. Therefore rejection of this element is also accordingly maintained.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-2, 10-12, and 15-16 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,751,343 to Ferrell et al.

With regard to claim 1, Ferrell discloses ***a method for performing defect spatial signature analysis*** (column 3, lines 55-64) ***of a semiconductor process*** (column 1, lines 64-66), ***comprising:***

Creating a defect database of wafers having defect spatial signatures (column 2, lines 53-64), ***wherein the defect spatial signatures in the defect database are uncategorized*** (column 6, lines 6-13).

Ferrell discloses determining feature vectors which are interpreted as defect spatial signatures because as disclosed in column 2, lines 60-65, a feature vector can correspond to an anomaly/defect characteristic. Applicant claims that a defect spatial signature describes a pattern of defects. This is also disclosed broadly by Ferrell in column 3, lines 1-11, where Ferrell teaches that the feature vector describing the defect location further defines a defect region using a characteristic defect mask. Ferrell

therefore sufficiently discloses determining defect spatial signatures in the disclosure of the determining of the feature vectors corresponding to defect locations, regions and characteristics. There should be no question that the defect spatial signatures claimed are effectively equivalent to the feature vectors of Ferrell used to describe defects.

Ferrell further discloses that the defect spatial signatures are uncharacterized in column 6, lines 6-13, because it is taught that all the images may be indexed and simply stored in a single file and needn't be stored in any particular database. This is interpreted to mean that the spatial signatures or feature vectors are not categorized in any way and that they are all thrown together in one file as a list of items.

The defect spatial signatures in the defect database are uncategorized data in that:

1. They can correspond to unclassified defects (column 13, lines 3-5).

2. Their arrangement in the HST is according to their relative similarity (column 9, lines 48-56), as opposed to some defect classification schema.

Ferrell further discloses ***generating a recent spatial signature*** (Fig. 3A, steps 14-16). Again the feature vector describing defect information is interpreted as a spatial signature and any of the stored feature vectors can be regarded as being recent (since the term is highly relative), the query vector (column 3, lines 39-41) will be interpreted to represent recent defect spatial signature. It is, perhaps most recent with respect to the stored feature vectors.

Ferrell further discloses ***determining if the recent defect spatial signature corresponds to at least one of the defect spatial signatures <u>reconstructed from the defect locations</u> in the defect database*** (column 11, lines 21-38).

With regard to claim 2, Ferrell discloses ***the method of claim 1, wherein the defect database contains uncorrelated <u>defect locations</u>*** (column 3, lines 30-33). Ferrell discloses Furthermore, the leaf nodes (e.g. V1, V2, V3, ... of Farrell et al. Fig. 6) in the HST of Farrell et al.'s method each encapsulate a feature vector (Farrell et al. column 3, line 19) and are added such that the encapsulated feature vector which is interpreted to describe defect locations is exclusive of the set of feature vectors present in the HST (Farrell et al. column 3, lines 30-33). In addition, redundant nodes are purged from the HST (Farrell et al. column 4, lines 15-17). As a result, one may conclude that the defect database (HST) contains essentially uncorrelated data or defect locations.

With regard to claim 10, Ferrell et al. disclose ***a method for evaluating defect spatial signatures*** (e.g. defects, represented by numerical descriptors or feature vectors - Farrell et al. column 2, lines 55-59, column 3, lines 4-6, column 4, lines 64-67 and column 5, lines 6-9) ***in a semiconductor process*** (Farrell et al. column 2, lines 8-33 and lines 36-41). The method of Farrell et al. comprises:

Generating a database of defect spatial signatures - for example, the Image Database 5 of Farrell et al. Fig.1 or the hierarchical search tree (Farrell column 3, lines

15-17). Ferrell further discloses ***wherein the defect spatial signatures are uncorrelated*** – for example, for each of the feature vectors (or images of the Image Database 5 - Farrell et al. column 4, lines 54-56 and column 6, lines 6-9) represents or corresponds to a defect. As shown above, with respect to claim 2, these feature vectors, and hence the associated anomalies, are uncorrelated. Please refer to the discussion of claim 1 above.

Ferrell further discloses ***inspecting a wafer having at least one defect spatial signature*** (e.g. capturing an image of a wafer - Farrell et al. Fig. 3A, column 4, lines 59-67 and column 5, lines 6-9).

Ferrelll further discloses ***determining if the at least one defect spatial signature corresponds to a defect spatial signature in the database of defect spatial signatures*** (Farrell et al. column 11, lines 21-38).

It has thus been shown that the method of Farrell sufficiently conforms to the method set forth in Claim 10.

With regard to claim 12, as shown above, the method of Farrell et al. adequately satisfies the limitations of claim 10. Following the discussions above with regard to claims 1 and 10, it should be clear that the ***defect spatial signatures*** (as represented by the aforementioned feature vectors) ***are uncategorized*** (column 3, lines 30-33). Ferrell discloses Furthermore, the leaf nodes (e.g. V1, V2, V3, ... of Farrell et al. Fig. 6) in the HST of Farrell et al.'s method each encapsulate a feature vector (Farrell et al. column 3, line 19) and are added such that the encapsulated feature vector which is

interpreted to describe defect locations is exclusive of the set of feature vectors present in the HST (Farrell et al. column 3, lines 30-33). In addition, redundant nodes are purged from the HST (Farrell et al. column 4, lines 15-17). As a result, one may conclude that the defect database (HST) contains essentially uncorrelated data or defect locations.

With regard to claim 15, Ferrell et al. disclose ***a method for determining the occurrence of an anomalous event*** (e.g. a defect or anomaly – see above and Farrell et al. column 2, line 65 and column 8, lines 13-30).

Ferrell further discloses ***storing a plurality of defect spatial signatures*** (i.e. defect masks - Farrell et al. column 8, lines 16-18) ***in a storage device***. These masks (presumably stored) are used to develop each feature vector in step 16 of Farrell et al. Fig. 3A (Farrell et al. column 9, lines 7-9), associated with the images stored in Image Database 5 of Farrell et al. Fig. 1 (Farrell et al. column 9, lines 20-21).

Ferrell further discloses ***wherein the defect spatial signatures are uncorrelated and uncategorized*** (column 3, lines 30-33). Ferrell discloses Furthermore, the leaf nodes (e.g. V1, V2, V3, ... of Farrell et al. Fig. 6) in the HST of Farrell et al.'s method each encapsulate a feature vector (Farrell et al. column 3, line 19) and are added such that the encapsulated feature vector which is interpreted to describe defect locations is exclusive of the set of feature vectors present in the HST (Farrell et al. column 3, lines 30-33). In addition, redundant nodes are purged from the

HST (Farrell et al. column 4, lines 15-17). As a result, one may conclude that the defect database (HST) contains essentially uncorrelated data or defect locations.

Ferrell further discloses ***creating a defect spatial signature*** (defect mask) ***of a recent anomalous event*** (e.g. a defect). See Farrell et al. column 3, lines 39-41 and note that the query image undergoes the same procedure as discussed above, wherein a defect mask is derived from the query image and used to determine the associated feature vector (Farrell et al. column 8, lines 13-30 and Fig. 3A).

Ferrell further discloses ***determining if the defect map of the recent anomalous event corresponds to one of the plurality of defect spatial signatures in the storage device*** (Farrell et al. column 11, lines 21-38).

It has thus been shown that the method of Farrell sufficiently conforms to the method set forth in Claim 15.

Rejections Under 35 U.S.C. Q 103(a)

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior ad are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 3-5, 8, 13-14, and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farrell et al., in view of La et al. (U.S. Patent 5,761,064).

The following is in regard to Claim 3. As shown above, the method of Farrell et al. adequately satisfies the limitations of claim 1. Farrell et al. do not expressly show or suggest that the defect database is a relational database of locations (e.g. Image Database 5 of Farrell et al. Fig.1 or the aforementioned hierarchical/ search free).

Relational databases have had a broad range of applications, in nearly every conceivable industry, to various types and forms of data. It is no surprise, therefore, that they have seen widespread application to the various data encountered in the semiconductor industry. For example, La et al. disclose an automated defect management system in which semiconductor wafer defect are collected from wafer inspection instruments (La et al. Abstract). The wafer defect data, which includes spatial information (e.g. reference numbers 144, 146, 148, 150, and 152 of La et al. Fig. 3), is stored in a central database system consisting of a relational database (La et al. column 3, lines 51-53).

The teachings of La et al. and Farrell et al. are combinable because they are analogous art - that is, each relate the field of defect detection and analysis and defect information storage. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to use, as La et al. suggests, a relational database for the storage of defect information, such as the feature vectors of

Farrell et al. The relational model used in relational database systems is particularly advantageous over other database schema, because it requires few assumptions about relationships between the disparate data contained in the database. This resolves much of the data inconsistency and scalability issues that plague so-called flat-file databases.

The following is in regard to Claim 18. Claim 18 recites essentially the same limitations as claim 3. Therefore, with regard to claim 18, remarks analogous to those presented above relative to claim 9 are applicable.

The following is in regard to Claim 4. As shown above, the teachings of Farrell et al. can be combined with those of La et al. so as to adequately satisfy the limitations of claim 3. In addition, Farrell et al. further disclose ***storing coordinates*** (e.g. the centroid (Xc, Yc) - Farrell et al. column 7, lines 23-28) ***of a process signature of a first <u>type</u>*** (i.e. the feature vector, in the collection of feature constituting the vector list corresponding to, say, a "first" defect - Farrell et al. Fig. 3A) ***and storing coordinates of a process signature of a second <u>type from each wafer</u>*** (i.e. the feature vector, in the collection of feature constituting the vector list, corresponding to, say, a "second" defect - Farrell et al. Fig. 3A). For the centroid to be meaningful, its coordinates must be expressed relative to some fixed coordinate system, preferably scaled and stationed fixedly with respect to the image, or other measured representation, of the defect or wafer. In this manner, ***the coordinates of the process signatures of the first and second <u>types</u>*** would be inherently ***in relation to each other***. Applicant has amended

claim 4 to include the limitation of the first and second types of process signatures are from each wafer. It is clear that there are certainly cases where more than one defect will occur on a single wafer and will be described by feature vectors in the invention of Ferrell and will be marked in the relational database of Li. Applicant has also changed the term "defect" to "type" with regard to the process signature description. The process signature of a first or second type is interpreted to be even more broad than the a process signature of a defect and accordingly a defect is still interpreted as a process signature of a first or second type.

The following is in regard to claim 19. Claim 19 recites essentially the same limitations as claim 3. Therefore, with regard to claim 19, remarks analogous to those presented above relative to claim 3 are applicable.

The following is in regard to Claim 8 and 13. As shown above, the method of The following is in regard to Claim 19. Claim 19 recites essentially the same Farrell et al. adequately satisfies the limitations of claim 1. Heeding the discussions above with respect to claims 3 and 4, it should be clear that the method, obtained by combining the teachings of Farrell et al. and La et al. in the manner proposed above, would involve:

(8.a.) Creating a relational database of defects. Refer to the discussion above relating to claim 3.

(8.b.) Storing coordinates of a process signature of a first defect and storing coordinates of a process signature of a second defect, wherein the coordinates of the process signatures of the first and second defects are relative to each other. Refer to the discussion above relating to claim 4.

By adopting the same interpretation of process anomalies as used in claim 10 (i.e. that process anomalies are defects, represented by numerical descriptors or feature vectors - Farrell et al. column 2, lines 55-59, column 3, lines 4-6, column 4, lines 64-67 and column 5, lines 6-9), it should be evident that previous discussion relating to claim 8 sufficiently addresses the limitations set forth in claim 13.

The following is in regard to Claim 5. As shown above, the teachings of Farrell et al. can be combined with those of La et al. so as to adequately satisfy the limitations of claim 3. La et al. further suggest the inclusion of defect density in the wafer defect data used for analysis (La et al. column 6, lines 49-50 and line 54). The defect density is, at least, local to wafer under observation. Furthermore, since density, as a physical measure, is inherently mathematical in nature (generally, a quantity (e.g. mass, number of defects, etc.) divided by a unit spatial quantity (e.g. unit volume, unit area, unit length, unit wafer surface-area, etc.), the defect density would necessarily be derived according to a mathematical formulation.

The following is in regard to Claims 14 and 20. Claims 14 recites essentially the same limitations as claim 5. Therefore, with regard to claims 14 and 20, remarks analogous to those presented above relative to claim 5 are applicable.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farrell et al. in view of Jain et al. (U.S. Patent 5,893,095).

The following is in regard to Claim 6. As shown above, the method of Farrell et al. adequately satisfies the limitations of claim 1. Farrell et al., however, do not expressly show or suggest adding the recent defect spatial signature (i.e. the query vector) to the defect database.

Jain et al. disclose a method for content-based search and retrieval of stored visual objects (e.g. imaged defects) based on similarity of content to a target (query) visual object (Jain et al. Abstract and Field of Invention). Like Farrell et al.'s method, the method of Jain et al. accepts a query image (Jain et al. column 4, lines 29-30 and Fig. 5A, steps 242 and/or 247), derives a feature vector (Jain et al. Fig. 5A, step 122 and column 12, lines 26-38) corresponding to the visual attributes (i.e. primitives - Jain et al. column 4. lines 2-8, column 6, lines 36-37, and column 8, lines 6-11) of the image, and determines a set of feature vectors, stored in a database (e.g. database 132 or FVi storage 264 of Jain et al. Fig. 5B), that are sufficiently similar (i.e. correspond to) the

input query vector (Jain et al. Fig. 5B). These feature vectors are analogous to the defect natures discussed above. As suggested by Jain et al. (Jain et al. Fig. 5B, step 247, column 11, lines 60-65 and column 21, lines 30-38), the query feature vector (i.e. the "recent" defect spatial signature - see above) may be added to the defect database.

The teachings of Jain et al. and Farrell et al. are combinable because they are analogous art. The functional and structural similarities of the two disclosed methods should be apparent. Moreover, Jain et al. suggests the application of their system and method to defecting and analyzing defects in semiconductor wafers (Jain et al. column 16, line 59 and 63-67 and column 4, line 67 to column 5, lines 1-3). Therefore, given the teachings of Jain et al., it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention, to add the recent defect spatial signature (i.e. the query vector) to the defect database. The motivation to do so would have been to provide persistent availability (via the data persistence offered by a database) to past defect queries.

12. Claims 7, 11, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farrell et al., in view of Tobin et al. (U.S. Patent 6,535,776).

The following is in regard to Claim 7. As shown above, the method of Farrell et al. adequately satisfies the limitations of claim 1. Farrell et al., however, do not

expressly show or suggest adjusting a process if the recent defect spatial signature corresponds to at least one of the defect spatial signatures of the defect database.

Tobin et al. disclose a method for localizing and isolating an errant process step by "integrating content based image retrieval, CBIR lan approach similar to Farrell et al.), ... with a ... database of defect imagery and corresponding defect characterization data (e.g. feature vectors such as those of Farrell et al.) to diagnose a defective product and identify an errant process causing the defective product" (Tobin et al. column 2, lines 13- 18). The method involves "providing to a content-based image retrieval engine, a query image depicting a defect', retrieving from the database), a selection of images, each image having image content similar to image content extracted from the query image', and, ranking the selection of images according to a similarity metric" (Tobin et al. column 2, lines 43-49). Moreover, Tobin et al. suggest using this information (i.e. the similar corresponding) defect images) to "localize, isolate, and correct (adjust) an errant manufacturing process step" (Tobin et al. column 1, lines 61-65), corresponding to the set of images similar (corresponding) to the query image. In other words, adjusting a process if the recent defect spatial signature (i.e. defect characterization data - Tobin et al. column 3, lines 4-12) corresponds to at least one of the defect spatial signatures of the defect database.

The teachings of Tobin et al. and Farrell et al. are combinable because they are analogous art. Specifically, both Tobin et al. and Farrell et al. use a CBIR approach for the detection of defects in semiconductor products. Therefore, given the teachings of Tobin et al., it would have been obvious to one of ordinary skill in the art, at the time of the applicant's claimed invention to adjusting a process if the recent defect spatial signature (the query feature vector of Farrell et al. or the defect characterization data of Tobin et al.) corresponds to at least one of the defect spatial signatures of the defect database. The motivation for doing so would have been to rectify errant processes that detract from the yield of the manufactured products.

The following is in regard to Claim 1 1. As indicated above, process anomalies correspond directly to defects and, therefore, defect spatial signatures. For this reason, they are treated as being essentially the same. Given this, Claim 11 recites essentially the same limitations as claim 7. Therefore, with regard to claims 11, remarks analogous to those presented above relative to claim 7 are applicable.

The following is in regard to Claim 17. As indicated above, Farrell et al. derive defect maps representing the defects of an observed wafer. The captured defect images used in Tobin et al.'s method can loosely be regard as being defect maps, as well. Taking this into account, it should be evident that remarks analogous to those presented above relating to claim 7 also apply to claim 17.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farrell et al., in view of the Applicant's admitted prior ad, as disclosed in the Applicant's Background of Invention (pages 1-2 of the Applicant's disclosure). For the sake of brevity, the Applicant's admitted prior ad will be referred to simply as Prior Art, henceforth in this document.

The following is in regard to Claim 9. As shown above, the method of Farrell et al. adequately satisfies the limitations of claim 1. Farrell et al., however, do not expressly show or suggest that the defect spatial signatures are from at least one of particle contamination, mechanical surface damage, wafer-spinning processes, scratching, and polishing.

According to Prior Art (Prior Art, page 1, lines 18-20), "events capable of causing semiconductor wafer) defects include, but are not limited to, particle contamination, scratching, polishing anomalies, wafer spinning processes, watermarks, particle stains, and micro-scratching".

The teachings of Farrell et al. and Prior Art are combinable because they are analogous arty. Specifically, the teachings of both Farrell et al. and Prior Art are directed to methods that detect defects in semiconductor wafers, or the like, using image analysis in tandem with a defect database. Therefore, given that particle contamination, scratching, polishing anomalies, wafer-spinning processes, watermarks, particle stains,

and micro-scratching are typical defects found during semiconductor wafer manufacturing, it would have been obvious to one of ordinary skill in the ad, at the time of the applicant's claimed invention, to accommodate defect spatial signatures (i.e. feature vectors) corresponding to (from) at least one of particle contamination, mechanical surface damage, wafer spinning processes, scratching, and polishing. The motivation for doing so would have been to detect defects corresponding to at least one of particle contamination, mechanical surface damage, wafer- spinning processes, scratching, and polishing.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is 571-272-7427. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wes Tucker

11-2-05

JINGGE WU
PRIMARY EXAMINER